PATENT
Attorney Docket No. 48972.830001.US0
Express Mail Label No. EV 357960224 US

UNITED STATES PATENT APPLICATION

FOR

IMPROVED SPORTS SHAFT

OF

MARK X. HAYDEN

and

Chad M. Wittman

IMPROVED SPORTS SHAFT

TECHNICAL FIELD

[0001] The present invention relates to sticks or shafts for use in sports and sporting activities. More particularly, the present invention relates to a shaft with improved weight, feel, flex, and grip.

BACKGROUND OF THE INVENTION

[0002] Various sports incorporate sticks or shafts players use to assist in propelling an object from one location to another. Tennis, hockey, lacrosse, baseball, racquetball, squash, etc. all incorporate some form of shaft. The shafts often include a specialized head that is either detachable or manufactured into the shaft. For example, most tennis racket shafts incorporate an integrated head that is configured to provide a bounceable surface for a tennis ball. Whereas, most lacrosse shafts incorporate a detachable head that is used to catch, throw, and cradle a lacrosse ball. The shafts must conform to certain rules and regulations particular to each activity. For example, baseball bats must conform to very strict size, weight, and composition requirements.

[0003] Players choose shafts they perceive will assist or increase their overall performance in playing a particular sport. Therefore, shaft manufacturers design and build shafts that conform to characteristics that players are likely to seek out. These characteristics generally include weight, feel, flex, off-set, and grip. The weight of a shaft is primarily dependent on the composition of the shaft. Shafts are often composed of wood, aluminum, graphite, carbon fiber, titanium, or other metal alloys. Each of these compositions has unique weight characteristics. The feel of a shaft depends on the manufacturing of the outer surface of a shaft. If a particular shaft does not feel appropriate, players are forced to add tape or rubber to the outside of the shaft in order to create the required feel. A shaft's flex also is dependent on the overall composition and shape of the shaft. In certain sports, the flex of the shaft is extremely important in

creating a whipping action to propel an object at a high speed. For example, in lacrosse, if a player wishes to throw the ball at a high speed, the player will use the shaft and head to whip the ball in a particular direction. The flex of the shaft can assist in generating additional force when used in this manner. It should be noted that a shaft should not be too flexible such that it would flex at undesirable times or easily break. The grip of a shaft is, in part, dependent on manufacturing of the outer surface of a shaft. The grip of a shaft relates, in part, to the amount of friction between a players hand/glove and the shaft during play. In most sports, it is desirable to have a sufficient amount of friction between the shaft and the player's hand so as to maximize the control the player has over the shaft.

[0004] One of the main problems with conventional shafts is that they do not maximize all of the characteristics desired by players. Certain shafts may have superior flex and feel but are unnecessarily heavy; other shafts may be lightweight but have little or no flex capabilities. In the field of lacrosse sticks, most of the shaft manufacturers sell traditional hollow, aluminum shafts because they are relatively lightweight, easy to manufacture, and provide a minor amount of flex. These conventional aluminum shafts must be modified to provide the right feel and grip desired by most players. Players commonly tape athletic tape around the bottom and top portions of the shaft to create improved gripping surfaces. The flex of the shaft cannot be improved with simple modifications and therefore must be endured.

[0005] The thermal conduction characteristics of sports shafts is also an important factor to many players. Aluminum shafts have a relatively high thermal surface conductivity coefficient. Therefore, heat transfer from the player's hands to the aluminum shaft or from the aluminum shaft to the player's hands occurs at a high rate, tending to give the shaft a cold or hot feel. However, many players may prefer shafts that do not feel cold or hot.

[0006] Therefore, there is a need in the industry for an improved sports shaft that maximizes the performance characteristics of a shaft and reduces the thermal surface

conductivity. In addition, the improved shaft should be relatively easy to manufacture such that it can be marketed at a reasonable fee to consumers.

SUMMARY OF THE INVENTION

[0007] The present invention relates to an improved sports shaft that is configured to maximize weight, flex, feel, surface conductivity, and grip. The improved shaft is comprised of a synthetic material designed to minimize weight and provide a desirable amount of flex. The shaft also includes a unique tapered portion that dramatically improves the shaft's flex and feel characteristics. The tapered portion is tapered lengthwise and widthwise to create a narrower portion to facilitate the stick flex. Frequently, the tapered portion is located to accommodate a player's hand position. The outer surface of the entire shaft is coated with a gripable composition having a lower thermal conductivity coefficient as compared to conventional shafts in order to improve the overall grip and feel characteristics of the shaft. In addition, the outer coating creates an aesthetic clean appearance in comparison to an uncoated shaft.

[0008] In one embodiment, the shaft is a lacrosse shaft. The lacrosse shaft includes an inward tapering portion disposed in a location consistent with where lacrosse players typically position their hands. The lacrosse shaft is composed of a semi-flexible synthetic material to provide the correct weight and flex. The lacrosse shaft is coated with a gripable material of low thermal conductivity to provide a desired feel. The lacrosse shaft includes an outward tapering head receiving portion that allows a detachable head to be attached to the lacrosse shaft. The detachable head can be mounted on both ends of the lacrosse shaft making the shaft reversible. In addition, the lacrosse shaft is coated with a gripable material that may include rubber to provide better grip and a warmer or cooler temperature perception depending on the climate. The cross-section of the lacrosse shaft is a rounded non-protruding octagon intended to maximize contact between a player's hands/gloves and the shaft and thereby improve the player's grip.

[0009] The embodiments described above may also be combined in order to create an anchor that is even less likely to suffer from a lateral rotational force during a procedure. The foregoing and other features, utilities, and advantages of the invention will be apparent from the following detailed description of the invention with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The accompanying drawings illustrate various embodiments of the present invention and are a part of the specification. The illustrated embodiments are merely examples of the present invention and do not limit the scope of the invention.

[0011] Figures 1 illustrates a profile view of a prior art lacrosse shaft;

[0012] Figure 2A illustrates a profile view of a lacrosse shaft and lacrosse head in accordance with one embodiment of the present invention;

[0013] Figure 2B illustrates a profile view of a women's lacrosse shaft in accordance with another embodiment of the present invention.

[0014] Figure 2C illustrates a profile view of a straight lacrosse shaft in accordance with another embodiment of the present invention.

[0015] Figure 3 illustrates a cross-sectional view of a prior art octagonal lacrosse shaft;

[0016] Figure 4 illustrates a cross-sectional view of an alternative prior art octagonal lacrosse shaft including flaring rounded edges; and

[0017] Figure 5 illustrates a cross-sectional view of a lacrosse shaft in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0018] Reference will now be made to the drawings to describe embodiments of the invention. It is to be understood that the drawings are diagrammatic and schematic

representations of particular embodiments of the present invention, and are not limiting, nor are they drawn to scale.

[0019] As a matter of design choice, the outer gripable material may be located strategically where a player will grip the shaft rather than cover the entire surface. However, the gripable material is preferably located substantially or entirely along the outer surface of the shaft. In addition, the outer coating may comprise a low thermal surface thermal conductivity coefficient and create an aesthetic clean appearance in comparison to an uncoated shaft. While embodiments of the present invention are described in the context of a lacrosse stick, it will be appreciated that the teachings of the present invention are applicable to other applications as well.

[0020] The present invention relates to an improved sports shaft configured to provide a shaft with weight, flex, feel, and grip superior to prior shafts. The improved shaft comprises a synthetic or natural material designed to minimize weight and provide a desirable amount of flex. According to one embodiment, the shaft also includes a unique tapered portion that dramatically improves the shaft's flex and feel characteristics. The tapered portion is tapered lengthwise and widthwise to create a narrower portion useful for a more comfortable hand grip, and may provide other advantages as well. Frequently, the tapered portion is located to accommodate a player's natural hand position or grip. The outer surface of the entire shaft or a portion thereof may be coated with a gripable composition to improve the overall grip and feel, and also to provide a low thermal surface conductivity coefficient.

[0021] One of the improved feel characteristics is the temperature perception of the shaft when gripped. The gripable composition comprises a low thermal conductivity coefficient, which reduces a rate of heat transfer conducted to the shaft from a player's hand or to a player's hand from the shaft. Therefore, the perceived temperature of the shaft when a user grips the shaft is warmer or cooler as compared to a conventional aluminum shaft. Although the actual temperature of the improved shaft is not affected by the gripable composition, the gripable composition reduces the rate of heat conducted

from the player's hand to the shaft or from the shaft to a player's hand, thus leading to a more comfortable temperature perception. According to some embodiments, the gripable composition is a rubberized paint or other elastomeric coating.

[0022] As used throughout the specification, including the claims, the term "low" as a modifier for a thermal surface conductivity coefficient, means less than about 0.047 cal/sec*cm*°C. The term "high" as a modifier for a thermal surface conductivity coefficient, means about 0.5 cal/sec*cm*°C. The words "including" and "having," as used in the specification, including the claims, have the same meaning as the word "comprising."

[0023] Reference is initially made to Figure 1, which illustrates a profile view of a prior art lacrosse shaft, designated generally at 100. The shaft 100 includes a lower grip portion 110, an elongated body 115, and a head receiving portion 105. The elongated body 115 is comprised of a metallic material including aluminum. Aluminum is traditionally used for lacrosse shafts because of its lightweight and semi-flexible properties. The grip and feel of a raw aluminum shaft is generally undesirable to most lacrosse players. Therefore, many manufacturers paint raw aluminum shafts to conceal the raw metal appearance. Unfortunately, painting does not improve the grip or feel. Accordingly, players and/or manufacturers commonly add external tape to the lower grip portion 110 of the shaft 100 in order to improve the overall grip and feel characteristics. The lower grip portion 110 is disposed near one of the ends of the elongated body 115 as illustrated in Figure 1. The head receiving portion 105 is simply an upper section of the elongated body 115 that is commonly used to attach a detachable lacrosse head. The head receiving portion 105 may include at least one hole for head mounting purposes. The cross-sectional shape of the prior art shaft 100 is described in more detail below with reference to Figures 3 and 4.

[0024] Reference is next made to Figure 2A, which illustrates a lacrosse shaft in accordance with one embodiment of the present invention. The lacrosse shaft is designated generally at 200. The lacrosse shaft 200 includes an inwardly tapered portion

210, and elongated body 215, and first and second head receiving portions 205, 230. While the tapered portion 210 is shown nearest the second head receiving portion 230, it is possible to provide the tapered portion 210 nearest the opposing first head receiving portion 205. Further, providing both head receiving portions 205 and 230 makes the stick reversible as each is receptive of a lacrosse head. According to Fig. 2A, a lacrosse head is attached to the first head receiving portion.

[0025] The tapered portion 210 is tapered inward from the remainder of the elongated body, meaning that the tapered portion 210 has a smaller diameter than the remainder of the shaft 200. On either side of the tapered portion 210, the elongated body tapers inward or narrows down to the width of the tapered portion 210. The inward tapering of the tapered portion 210 is preferably consistent on all of the outer sides of the lacrosse shaft 200 in order to create a uniformly narrower section. The inward taper may improve the grip and feel of the shaft by providing a contoured location for a user's hand(s). In addition, the combination of the semi-flexible synthetic composition and the inward taper can assist in allowing a player with whipping the shaft. Players often whip lacrosse shafts in order to throw the ball at a high speed. The whip or flex is facilitated more or less depending on whether the detachable head is attached to first receiver portion 205 or second receiver portion 230.

[0026] The elongated body 215 comprises a semi-flexible, preferably synthetic material including but not limited to: carbon fiber, graphite, plastic, composites, etc. According to the embodiment shown, the entire elongated body 215 is coated with a gripable material 217 having a low coefficient of thermal surface conductivity. The gripable material may include, but is not limited to: rubber, leather, vinyl, cloth, and elastomeric paints and coatings. Providing the gripable material 217 with a low coefficient of thermal surface conductivity causes the shaft 200 to feel warmer or cooler in a player's hand than conventional shafts. For example, if the gripable material is an elastomeric coating as shown, the coefficient of thermal surface conductivity is approximately 0.00045 cal/sec*cm*°C. On the other hand, conventional aluminum

lacrosse shafts have a thermal surface conductivity coefficient of approximately 0.5 cal/sec*cm*°C.

[0027] Therefore, if a user's hand is warmer than the shaft, heat will transfer from a user's hand to a conventional aluminum lacrosse shaft more than 1000 times faster than it will from the user's hand holding a shaft comprising an elastomeric coating. The result is a much warmer feel to the shaft 200 of the present invention. Similarly, if the shaft is warmer than a users hand, the use of the gripable material 217 reduces the heat transfer from the shaft 200 to the user's hand, giving the shaft 200 a cooler feel than conventional aluminum shafts. And while the gripable material is preferably elastomeric, any gripable material with a low coefficient of thermal surface conductivity (i.e. equal to or less than about 0.047 cal/sec*cm*°C, the coefficient for titanium) may be used.

[0028] While the gripable material coating 217 is shown covering all or substantially all of the elongated body 215 as shown, according to other embodiments the gripable material coating 217 covers only selected sections of the elongated body 215. For example, the gripable material may cover only portions of the elongated body 215 that tend to be gripped by players. The application of the gripable material coating 217 may be performed during or after the lacrosse shaft 200 forming process. The gripable material coating 217 dramatically improves the grip and feel of the entire shaft.

[0029] Lacrosse players occasionally grip the shaft at different locations in order to, for example, cradle the ball in tight situations or shoot. In embodiments such as the one shown in Fig. 2A with the gripable coating substantially covering the entire elongated body 215, the feel of the entire lacrosse shaft 200 is significantly more attractive to a player than the feel of the conventional shaft described with reference to Figure 1. The combination of the semi-flexible material and the gripable material coating 217 creates a unique feel that is immediately noticeable upon use. Embodiments of the lacrosse shaft 200 may also include a graphic 222 on one or each of a first and second side 220, 225.

[0030] Reference is next made to Figure 2B, which illustrates a lacrosse shaft in accordance with another embodiment of the present invention. According to Fig. 2B, the elongated body 215 is thinned down to women's size, and the first and second head receiving portions 205, 230 are flared or reverse tapered as shown. The flared first and second head receiver portions 205, 230 are configured to allow a detachable lacrosse head of standard size to be mounted on the shaft 200 without any additional attachments. Conventional women's lacrosse shafts do not flare out at the first head receiving portion, and thus require the use of an additional mount to attach a standard lacrosse head to a smaller shaft. A detachable head (not shown) can be mounted and fastened to the narrower main portion of the elongated body 215 such that the detachable head cannot be removed from the shaft 200 without loosening a fastener. The fastening can be completed with a circular clamp, one or more screws, a string, or other fasteners. As shown in Figs. 2A-2B, holes 235 (shown in phantom) extend through the shaft 200 to secure the detachable head to the shaft 200 at either the first or second head receiver portions 205, 230.

[0031] Similar to the embodiment of Fig. 2A, the shaft 200 of Fig. 2B includes the inwardly tapered portion 210 disposed near one of the ends of the elongated body 215 in a location that is most commonly used by lacrosse players to grip the shaft 200. However, the inwardly tapered portion 210 may also be located centrally between the ends according to some embodiments.

[0032] While Figs. 2A-2B illustrate the elongated body 215 with the inwardly tapered portion 210, some embodiments of the shaft 200 do not include the tapered portion 210. For example, as shown in Fig. 2C, the shaft may have a substantially constant diameter. Further, depending on the shaft size, one or both of the first and second head receiving portions 205, 230 may or may not be flared. According to the embodiment shown, the first and second head receiving portions 205, 230 are not flared.

[0033] One method of manufacturing the shafts 200 illustrated in Figures 2A-2C comprises utilization of graphite or other materials. According to one embodiment, a

graphite sheet is wrapped around an internal member such as a dowel. The number of times the graphite sheets is wrapped around the dowel determines the strength of the shaft. Therefore, stronger shafts may be wrapped multiple times. When the desired number of graphite layers has been achieved, the dowel is removed, leaving the graphite in a tubular arrangement. The tubular graphite is then inserted into a mold, where it is heated and formed into the mold shape. The tubular graphite is thus preferably hollow, but according to some embodiments it may also be solid. The graphite is subsequently cooled, and the graphite hardens into the shaft 200. As mentioned above, the graphite shaft may have the gripping layer 217 applied, for example the rubber, leather, vinyl, cloth, rubberized paints, or other materials mentioned above that comprise a low thermal surface conductivity coefficient.

[0034] Reference is next made to Figures 3 and 4, which illustrate cross-sectional views of two different conventional lacrosse shafts. Figure 3 illustrates a standard octagonal shape with pointed edges and Figure 4 illustrates an octagonal shape with flaring rounded edges. Both of the cross-sections are hollow, meaning they only contain material at the outer edges of the shaft. The shafts 300 and 400 are hollow in order to minimize weight and manufacturing costs. One of the problems with these designs, however, is that they do not maximize contact between a player's hand/glove and the shaft. Pointed edges or flaring rounded edges push a player's hands or gloves away from the shaft, thereby reducing the grip.

[0035] Reference is next made to Figure 5, which illustrates a cross-sectional view of a shaft in accordance with some embodiments of the present invention. The shaft 500 has a general octagonal shape but has non-protruding rounded edges. It is desirable to include multiple flat surfaces on a shaft to provide increased grip characteristics. However, it is not desirable to include numerous sharp edges or protruding edges that prevent contact with the surfaces. Therefore, the cross-section of the lacrosse shaft in accordance with the present invention is superior to the conventional designs. The shaft

500 shown is hollow, although according to some embodiments the shaft 500 may also be solid.

[0036] While this invention has been described with reference to certain specific embodiments and examples, it will be recognized by those skilled in the art that many variations are possible without departing from the scope and spirit of this invention. For example, the teachings of one embodiment may be combined with the teachings of another and remain consistent with the scope and spirit of this invention. The invention, as defined by the claims, is intended to cover all changes and modifications of the invention which do not depart from the spirit of the invention.